

REMARKS

I. Introduction

Claim 7 is pending in the present application. In view of the foregoing amendments and the following remarks, it is respectfully submitted that claim 7 is allowable, and reconsideration is respectfully requested.

II. Rejection of Claim 7 Under 35 U.S.C. § 103(a)

Claim 7 was rejected under 35 U.S.C. § 103(a) as unpatentable over the combination of U.S. Patent No. 4,245,789 ("Gray") and U.S. Patent No. 5,732,888 ("Maier et al."). It is respectfully submitted that the combination of Gray and Maier et al. does not render unpatentable claim 7 for at least the following reasons.

Claim 7 relates to a fuel injector for a fuel injection system of an internal combustion engine. As amended herein without prejudice, claim 7 recites a solenoid coil, an armature acted upon in a closing direction by a restoring spring, and a valve needle, which is connected to the armature by force-locking and at which a valve-closure member is formed, which forms a sealing seat together with a valve-needle surface, the armature facing and striking against a stop face of an inner pole of the solenoid coil by way of an armature stop face, wherein **both the armature stop face and the stop face of the inner pole have the same coating**. Claim 7, as amended herein without prejudice, further recites that the coating is deposited on the armature stop face and on the stop face of the inner pole in a plurality of chromium layers, the coating having a surface structure with raised areas and recessed areas, wherein the raised areas have a dome-shaped design and the height difference between the raised areas and recessed areas is initially between 5 μm and 10 μm and is reduced to between 4 μm and 5 μm during use of the fuel injector. Support for the amendments to claim 7 may be found, for example, at page 5, lines 12 to 13 of the Specification. Coating both the armature stop face and the stop face of the inner pole provides improvement over simply coating only one or the other of the stop faces. Particularly, apart from protecting both surfaces against wear and improving the flow-off of the fuel when the armature is pulled up in response to an energizing of the solenoid coil, this feature reduces the cavitation of the armature stop face as well as the stop face of the inner pole.

Gray teaches providing the softer one of the opposed working air gap surfaces of the pole piece and armature of the injector solenoid assembly with an average surface roughness rating value on the order of 16 to 32 micro-inches. See, e.g., Abstract. Moreover, Gray discloses a non-magnetic, case-hardened shim 78 that is positioned between the core of the pole piece so that the stop face of the inner pole and the stop face of the armature do not directly face each other, in contrast to the structure defined in amended claim 7. It is further noted that Gray does not teach or suggest applying a coating, but rather teaches grinding and subsequent lapping of a respective surface to achieve a surface roughness. In this regard, it is respectfully submitted that Gray fails to disclose or suggest an armature stop face and a stop face of an inner pole that have the same coating. Moreover, it is respectfully submitted that Gray teach away from this feature, as Gray only discloses providing the softer one of the opposing surfaces with a surface treatment and to grind the surface, rather than providing an additional coating thereon.

At column 4, lines 1 to 4, Maier et al. state that “[t]he application of metallic coatings 65, for example of chromium or nickel coatings, to the core end 9 of the core 2 and to the armature 27, by galvanization methods, is already known.” Maier et al. continue, however to state that “[t]he coating thickness of these coatings 65 generally measures between 10 and 25 μm .” Col. 4, lines 11 to 12. In contrast to the teaching of Maier et al., claim 7 provides for a **plurality of chromium layers that are applied to both armature stop face and the stop face of the inner pole which measure initially between 5 μm and 10 μm and which -- in their stable state -- are reduced to 4 μm and 5 μm** , which height then is maintained during further use, rather than being further reduced. It is respectfully submitted that Grey and Maier et al. -- **alone or in combination** -- do not disclose, or even suggest this feature.

Moreover, with respect to Maier et al., it is noted that Maier et al. disclose a coating that has a wedged structure instead of a dome-shaped structure. At column 4, lines 19 to 24, Maier et al. state that “[d]uring the galvanic coating, there develops at the edges of the parts to be coated, in this case the core 2 and armature 27, a field line concentration, which results in the development of a wedged coating thickness distribution as indicated in FIG. 2.” Maier et al. further explain that “[t]he applied wedged coating 65, when the injection valve is running, is only therefore, subjected to load in a small region. In continuous running, however, a defined impact

face is no longer present, since parts of the coating 65 are worn away as a result of several million impacts, so that the impact face grows increasingly large and hence the wedging is constantly being further reduced." Col. 4, lines 23 to 30. Thus, it is respectfully submitted that one of ordinary skill in the art would not have considered the use of such a galvanic coating process as described above. As such, neither the dome-shaped structure made up of several layers of coating nor the height difference of 5 μ m to 10 μ m are disclosed, or even suggested, by Maier et al., such that these features are not disclosed or suggested by the combination of Gray and Maier et al.

As indicated above, the combination of Gray and Maier et al. does not disclose, or even suggest, all of the features recited in claim 7. As such, it is respectfully submitted that the combination of Gray and Maier et al. does not render unpatentable claim 7. Accordingly, withdrawal of this rejection is respectfully requested.

III. Conclusion

In light of the foregoing, Applicants respectfully submit that all pending claims are in condition for allowance. Prompt reconsideration and allowance of the present application are therefore earnestly solicited.

Respectfully submitted,

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